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SOCIAL WASPS (HYM. VESPIDAE) FROM TRINIDAD, WITH A NOTE ON THE GENUS *TRYPOXYLON* LATREILLE

By D. Vesey-FitzGerald.

(Read 1st June, 1938.)

With Plates 1–3.

The following notes and observations were made during various periods of residence in Trinidad between the end of 1931 and 1935.

I am greatly indebted to Dr. J. Bequaert for determining the material and to Dr. O. W. Richards for the interest he has taken in the parasites, most of which have been determined with his help.

I wish also to acknowledge the help and encouragement of the late Mr. F. W. Urich, in whose congenial company most of the collecting was accomplished.

Lastly I must thank Fr. Maingot, O.S.B., for much help in the field and for several of the photographs of nests.

Polistes Latreille.

Four species of this genus were collected in Trinidad.

P. canadensis (L.). Typical form. "Jack Spaniard." Common throughout all settled areas.

P. pacificus (F.). Mt. St. Benedict, 11.iv.33, 20.v.33, 17.xi.34; Mt. Tabor, 22.iv.33; Port-of-Spain, 20.ii.35; Mayaro, 8.iv.33; Pt. Citron, Trinity Hills, 24.xii.34. Common. Besides the typical form, Mr. Urich showed me a specimen from the Northern Range which appears to be a melanic variety of this species. He told me that all the members of the colony from which he took this example were similarly coloured. This dark pattern is particularly interesting since it closely resembles the normal marking of *Polybia sycophanta* Grib.

P. versicolor (Ol.) var. *vulgaris* Beq.: St. Augustine, 20.i.32, 26.v.32; Gasparee Island, 4.xi.34; Icacos, 29.x.35; Maracas Valley, 31.x.35. Common.

P. carnifex (F.) var. *ochreata* Spinola. Le Cordonnier, Mayaro, 2.iii.34 (F. W. U.), 27.i.35; Balandra Bay, 20.v.35. This species is extremely local, or perhaps sporadic in appearance. At the present time it seems confined to the above two localities on the east coast, but careful collecting in the same area previous to 1934 failed to reveal this conspicuous species. Urich records the species from Brighton, on the west coast, some years ago, and there are specimens in the British Museum, from the island of Tobago (Sworder, Coll.: 1914). This *Polistes* was not, however, found in either locality during frequent visits between 1931 and 1935. The probable explanation is that this species is a vagrant from Venezuela, which fails to establish itself permanently in Trinidad.

The species of *Polistes* are confined to areas of cultivation or secondary forest.

The "nests" are placed under some shelter. Roofs of buildings, and the unsplit leaves of young coconuts are favourite sites. *P. versicolor* is especially abundant in the deciduous secondary forests of the dry islands in the Bocas, and is the only species which has been collected on Patos Island (Urich).

P. pacificus is the characteristic species of secondary forest, where it nests in the shelter of crevices in banks, or amongst vegetation.

The nests of *Polistes* consist of a naked comb. The initial cell is built at the end of a supporting stalk, and subsequent cells are constructed in rows laterally. The resulting comb is therefore leaf-shaped (fig. 1).

P. carnifex is exceptional in that the cells are built around the first formed cell. The combs of this species are therefore circular and the stalk more or less central.

The colonies of *P. carnifex* are small, the largest comb examined only containing fifty-nine cells. The other species form much larger colonies. The method of forming a new colony seems to vary within the species. One or two fertile females usually leave a big colony and build a small separate comb in the neighbourhood. But regular migrating " swarms " may at times be encountered. *P. versicolor* has been chiefly studied in this connection and the following examples noted :

Example 1. A " swarm " composed of twelve females, all except four with developed ovaries, was taken resting on a rootlet which would have made a typical nesting site.

Example 2. A group of ten wasps (not dissected) taken on a new comb of only four cells.

Example 3. A single adult attending a nest composed of sixteen cells containing only very young larvae.

P. canadensis uses the fibre of dead but sound wood for nest-building purposes. The fibre is stripped with the mandibles and at the same time moistened with saliva till it can be worked into a ball of pulp suitable for transport to the nest.

Polistes are aggressive when disturbed on the nest, but are not very persistent in their attack.

Their associations with other animals have been studied chiefly in the case of *P. canadensis*. Birds' nests are very frequently associated with *Polistes* colonies. In one case no less than three nests of *Arundinicola leucocephala* (Linn.), one of which contained a sitting bird, were found on the same branch as a large *P. canadensis* colony.

The hunting ant, *Eciton burchelli* auct., has been observed to raid the comb, and while the ants swarmed in and out of the cells, removing eggs and larvae, the adult wasps hovered round in despair, and soon, as if realising resistance was hopeless, forsook the neighbourhood.

A small moth, *Tinea latebricola* Meyrick, is an important enemy of *P. canadensis*. The life history of this moth is interesting. The adults are very active, but unwilling, or perhaps in the case of the females which have greatly distended abdomens and very small wings, unable, to take flight. They run about over the combs with rapidly vibrating antennae, and lay their white, and comparatively large (length 0·2 mm.) eggs, singly or in clusters in crevices of the cells. The larvae which are, when full grown, 5 mm. long, white with a few white hairs on the body and light brown heads, make their way from cell to cell through small holes eaten in the dividing walls. No doubt these larvae act primarily as scavengers, but they will attack the living *Polistes* pupae, at a period just before the latter is ready to emerge as an adult. The caterpillars enter the tip of the abdomen of the wasp and feed on the contents, and examples have been observed in which the wasp was still able to move its legs and antennae although its abdomen was full of feeding caterpillars.

Another moth which has only been found as a scavenger amongst the

debris at the bottom of the cells of an inhabited nest is *Epithectis sphecophila* Meyrick. This species is less abundant.

Mites (of undetermined species) are frequent in the cells, one species in particular being found on the body of the wasp larvae and pupae. A favourite resting position for this last species being in rows along the developing wings of the wasp pupae. When the immature wasp is ready to emerge, all these mites migrate to the tip of the abdomen and none has been found on an adult wasp. These mites must feed on body secretions only, since they have never been found to harm the developing wasp in any way.

Polistes pacificus larvae are parasitised by an unknown Dipteron, which itself is hyperparasitised by the Encyrtid, *Signiphora polistomyiella* Richards. Forty-three of the latter have been reared from one puparia.

One colony of *P. pacificus*, composed of twelve adults, was found attacked by an undetermined Strepsipteron. Every individual was parasitised, and all were very lethargic.

Another comb of the same species contained large numbers of an undetermined apterous Psocid, and though the nest was attended by seven adults, the cells contained no brood.

Mischocyttarus Sauss.

Six species of this genus were collected in Trinidad.

M. injucundus (Sauss.). Mt. St. Benedict, N. Range, 31.vii.33; Botanic Gardens, Port-of-Spain, 26.xi.33, 29.i.35; Pt. Galeota, 16.iv.33.

M. surinamensis (Sauss.). Mt. St. Benedict, 22.i.35, 26.ii.33, 16.v.33, 13.viii.33, 12.xii.35; Gasparillo Road, N. Range, 12.i.35; Las Cuevas Road, 1.i.35; St. Augustine, 26.x.31; Maracas Valley, 10.v.32; Mayaro, 27.i.35; Caura Valley, 1.xi.33.

M. punctatus (Ducke). Mt. St. Benedict, 8.v.33; St. Michaels Valley, N. Range, 24.iv.33.

M. labiatus Fab. Mt. Tabor, N. Range, 24.i.32, 16.ii.32, 20.v.35; St. Michaels Valley, 6.iv.33; Gasparillo Road, 29.xi.34; Las Cuevas Road, 1.i.35; Caura Valley, 1.x.34.

M. ater (Ol.) var. *uniformis* Beq. Mt. Tabor, N. Range, 22.iii.33, 20.v.33; Arima-Blanchisseuse Road, 1.v.33.

M. fitzgeraldi Beq. Nariva Swamp, 10.iii.35.

The species of the genus *Mischocyttarus* belong to areas of secondary forest and clearings in primary forest. Favourite nesting sites are under the shelter of crevices in banks, under the thatched roofs of huts, or amongst vegetation. *M. injucundus* is fairly frequent in well-wooded gardens, and *M. surinamensis*, which is the commonest species, is to be found nesting under the eaves of houses in settled districts.

The colonies of *Mischocyttarus* are small, and the wasps are extremely docile, apparently relying for their safety on the usually inconspicuous nature of their nests and their own striking resemblance to other aggressive wasps (see below). Their " nests " consist of a naked comb.

M. surinamensis forms the largest colonies, for though smaller " nests " are the rule, one comb composed of one hundred and six cells, and another of one hundred and one cells have been examined. The former was the shape of a spear head, 8·2 cm. long by 2 cm. across at the widest part, the whole being suspended from a short stalk from the first formed cell. The second " nest " was also spear-head shaped and was occupied by a colony of 2 ♀♀, 12 ☿☿ and 21 ♂♂ as well as brood in all stages.

The comb of this species is made of a straw-coloured paper, and, especially when the yellow adults are on the comb, is very conspicuous. Since, however, this species is indistinguishable, in the field, from the aggressive *Gymnopolybia pallipes* (Ol.), it may derive a certain amount of protection by being conspicuous.

M. injucundus builds a more or less rectangular comb supported by an eccentric pillar. The largest examined contained sixty-nine cells. The paper is brittle, and dark coloured, and since the wasp is dark reddish-brown, the colony is comparatively inconspicuous. However, this wasp exactly resembles in appearance the extremely aggressive *Polybia rejecta* (Fab.).

M. ater makes an even smaller nest, the comb seldom containing more than ten cells. Neither the wasp nor the comb is particularly conspicuous, but this species very closely resembles in appearance the aggressive *Parachartergus apicalis* (Fab.).

The nest of *M. punctatus* has been described by Ducke from Brazil. A Trinidad specimen which was examined was composed of three cells. The initial cell was attached to a rootlet by a short stalk which was 1 cm. long, the cell itself being 12 mm. deep by 3 mm. diameter. The second cell was built on to the lip of the first, and the third on to the lip of the second. In larger nests a chain of cells is formed in this way and since the paper is of a grey-brown colour, the whole nest resembles a dry twig and is most inconspicuous. This wasp closely resembles in colour pattern the comparatively harmless *Polybia occidentalis* (Ol.).

Mischocyttarus fitzgeraldi, which was collected only once, builds a most extraordinary nest, intermediate in design between that of *M. punctatus* and the other species. This nest was composed of about forty cells. The first fifteen formed a comb supported by a stalk from one side. The next series of eight arranged in two rows was fixed to one corner of the first series. The remaining cells were in pairs, each attached to the corner of the previous pair. The comb was built on to a dry vine, and being composed of dark brown " paper," closely resembled a dead leaf. When disturbed the wasps fell off the nest as if dead; they, however, checked themselves before touching the ground and flew off. This species rather closely resembles an undetermined *Polybia*.

M. labiatus is at the same time one of the commonest and the largest member of the genus to be found in Trinidad. The nests are usually hidden away in crevices in banks, and consist of a comb composed of a circular mass of cells, suspended by a very long (32 mm.), central petiole, which is thin, wire-like, and highly polished. This species does not bear a very close resemblance to any other Trinidad wasp, but its general colour is not unlike that of *Polistes canadensis* (L.).

Certain points in the life history of these wasps are of interest, because they show a general common tendency to similarity for all members of the genus.

The eggs are laid in the bottom, or in an angle in the wall of, a mere pocket-like cell, and as the young larva develops the cell is deepened. In the case of *M. injucundus* and *M. ater* a drop of clear honey-like liquid has occasionally been found in either an otherwise empty cell or a cell containing an egg.

The full-fed larva spins a silken cap *within* the mouth of the cell and subsequently the parent wasps cut away the projecting cell wall to the level of the cap. This fact, together with the heightening of the cell walls as the larva develops, makes a very irregular surface, characteristic of the combs of this genus.

Apparently in order to prevent the normally white pupal caps rendering the nest conspicuous, these caps are stained dark coloured in the case of *M. injucundus* and *M. fitzgeraldi*. In the case of *M. surinamensis*, the combs of

which are straw coloured, the caps are semi-transparent, and after they are spun by the larvae the parent wasps "splash" their outer surface with strips of "paper."

Cells in which the development of one generation has been completed are re-used.

Colony formation has only been studied in the case of *M. surinamensis*, the following examples being recorded :—

Example 1. A single female was observed to be sole guardian of a comb composed of eight cells, containing brood of all ages, including one pupa. Five days after the nest was first found a second "cap" was formed. The original female remained on the nest for a further three weeks, when the pupae, which had not hatched, were examined and found to be parasitised.

Example 2. Another nest, in a further stage of development, contained, when first found, fifteen cells. There was usually one wasp only, probably the original female, on guard during the day time, but at night three more wasps would be present. The nest was kept under observation for a fortnight, during which time three new cells only were added, and four of the larvae present when the nest was first found pupated. No more adults emerged during the period of observation.

The above examples, which appear to be typical for this species, tend to show that a single fertile female, which can be distinguished in the field by being slightly larger than the worker and with a comparatively wider head, or upon dissection by the presence of developed ovaries, constructs a small comb and rears two or three workers. These latter spend a considerable portion of their time during the day away from the nest.

M. surinamensis pupae have been found parasitised by an Ichneumon and a Dipteron. The latter has not so far been reared in captivity, since it is itself hyperparasitised by the Encyrtid, *Signiphora polistomyiella* Rich.

It is also worth recording, in view of what was noted above about the resemblance of this species to the aggressive *Gymnopolybia pallipes*, that *M. surinamensis* has been found held by an Attid spider and also in the gizzard of the swift, *Streptoprocne zonaris albicincta* (Cabanis).

Larvae of Phorid flies are frequently found in the cells of *M. labiatus*. One nest composed of eleven cells, and containing a pupa, was observed to contain a few Phorid larvae which were apparently scavenging in the debris at the bottom of the cells. Ten days later forty-two adult flies emerged, and then an examination showed that the wasp pupa had been completely hollowed out by the Phorid larvae.

Polybia Lepeletier.

Three species of this genus were studied in Trinidad, a fourth species collected on only one occasion remains undetermined, and a fifth, which was not collected, but stands on the list is *P. bifasciata* Sauss.

P. rejecta (Fab.). Mt. St. Benedict, 6.iv.33, 22.iv.33; Arima-Blanchisseuse Road, 28.v.35; St. Augustine, 10.xii.34; Staubles Bay, 10.xii.34; Erin, 23.i.35; Bloody Bay, Tobago, 29.ix.35; Maracas Bay, 12.i.35. Common.

P. occidentalis (Ol.). Mt. St. Benedict, N. Range, 5.iv.33; Mt. Tucuche, 3000 ft., 16.xii.34; Morne Bleu, 4.xi.31; Heights of Aripo, 20.iii.33, 19.v.35; Nariva Swamp, 21.v.35; Mayaro, 5.i.35, 17.i.35; Galeota Point, 25.x.34; Chacachacare Is., 3.ii.35; Bloody Bay, Tobago, 29.ix.35. Common.

P. sycophanta Grib. Mt. Harris, Central Range, 2.ix.32; Guayaguayare, 20.i.35. Rare.

Polybia is essentially a genus of forest wasps, but inasmuch as *P. rejecta* and *P. occidentalis* are two of the commonest members of the Vespid fauna of Trinidad, they may be found anywhere in wooded country.

The nests are usually situated in trees at varying heights from the ground; one example of *P. rejecta* was taken at a height of forty-five feet in a coconut tree. The more delicate nests of *P. occidentalis* are usually sheltered by being situated on the undersides of the broad leaves of forest floor vegetation. Small *Citrus* trees are also very favourite nesting sites for this species. The only nest of *P. sycophanta* examined was on the branch of a second-story tree in primary rain forest.

The structure of the nest has been studied in the case of *P. occidentalis*, and it is worth noting that the peculiar tooth-like projections round the bottom of the nest, as recorded by Schwarz (1931), are frequently seen in Trinidad (fig. 4). The nest, though varying much in shape, is box-like. The initial " roof " comb is the smallest, and subsequent combs are progressively larger. For example, in one nest examined the first comb was 17 mm. in diameter and the fourth 70 mm. in diameter. New combs are formed by cells being constructed on the bottom side of the floor of the envelope, and subsequently this new-formed comb is closed in by an extension of the sides of the envelope and later by a new floor being built at a lower level. This method of nest construction is characteristic of all species.

Old cells are re-used as soon as their former tenant has completed its development.

A large nest, containing five combs, was found to be occupied by three hundred and eighty wasps, but this figure does not allow for a few which escaped, and others that may have been out foraging.

The initiation of a colony has been observed for *P. rejecta* and *P. sycophanta*; in both cases it was by means of a " swarm." In the case of *P. rejecta*, Fr. Maingot of Mt. St. Benedict drew my attention to a cluster of over three hundred wasps on the leaf of an ornamental palm. After resting for two days this " swarm " moved on and was lost. In the case of *P. sycophanta*, a large swarm was found constructing a nest, which at the time of discovery was 15 cm. in diameter and 9 cm. deep, and contained four combs, the smallest at the top having seventy-five cells and the largest at the bottom, which was still exposed, five hundred cells. At the time, however, only a few eggs had been laid in the cells of the topmost comb (fig. 6).

It is not unusual for *Polybia* to provision their nests. " Nectar " has frequently been found in the cells of *P. rejecta* and *P. occidentalis*, and the same cells may, or may not, contain an egg. Winged ants are frequently stored by *P. rejecta*; such prey is mutilated by the removal of the wings, legs and frequently the head also; nevertheless the torso may still be capable of feeble movement. The wasp larvae have been observed to feed on this prey.

All species of *Polybia* are extremely aggressive; though in the case of the small *P. occidentalis* the result of an attack is not very dangerous. It is interesting, however, to find the members of this genus the " hub " of an extraordinary complex of striking resemblances. Individually the wasps are not immune from predators since the Asilid, *Nusa erythropyga* Wied. has been collected carrying *P. rejecta*, and Attid spiders frequently catch *P. occidentalis*. The associations between *Polybia*, ants and birds have been dealt with before, Myers (1929). One very fine example may be cited, as it throws some light on the phenomenon. The case in point was of two large nests of *Polybia rejecta* in a small guava tree, which also supported a number of the carton

nests of the ant *Azteca* sp. (fig. 8). It is clear that the ants were the initial colonisers, since guava trees have been observed to be favoured by the ants, whereas the wasps nest in almost any tree. This selection on the part of the ants may be due to the usual prevalence of COCCIDAE on guava. Also there was present a third small *Polybia* nest which was actually touching and in fact distorted to fit against one of the ants nests. In the same tree was also a nest of the bird *Coereba luteola* (Cabanis) which was evidently constructed subsequently to both the ants and the wasps.

Two species of TACHINIDAE reared from the nests of *Polybia* have been recently described by Curran (1937).

The first, *Telothyriosoma polybia* Curran was reared from a nest of *P. rejecta*. The fly larvae had pupated in the cells of the wasp's nest. The second, *Polybiophila fitzgeraldi* Curran was associated with *P. occidentalis*. The larvae of this species were observed to emerge from a silken-covered cell in which was found the flabby remains of a wasp grub. They wriggled with great activity, until they tumbled out of the nest through the entrance hole, and subsequently they pupated in sand, emerging as adults after a period of about thirteen days.

Gymnopolybia Ducke.

Though *G. cayennensis* (Fab.) and *G. vulgaris* (Ducke) also stand on the Trinidad list only the following species was collected :—

G. pallipes (Ol.): Maracas Valley, 15.iv.35; Tucuche, 3000 ft., 16.xii.34; Caura Valley, 1.xi.34; Valencia Road, 6.xi.35; Nariva Swamp, 5.xii.34; Mayaro, 30.xii.34. Common.

This is essentially a forest wasp, but while it is unusual in primary lowland rain forest, it is abundant in mountain secondary forest, and well-wooded settled areas in the lowlands.

The colonies are extremely populous and the wasps are very aggressive. The nests are built in cavities : fallen trees, which are hollow, being a favourite situation. A nest examined in a dead log occupied a cavity 56 cm. by 30·5 cm., the comb mass being 39 cm. by 24 cm. by 21·5 cm. There were eleven combs, which were very irregular in shape. They were arranged more or less concentrically, but, since the mass was considerably longer than wide, the outer four combs, instead of encircling the inner eight, simply formed arcs of a circle around them. All the combs were vertical and the cells horizontal (fig. 5). This peculiar arrangement may not be altogether typical, since in the only other nest examined the combs were set at an angle of 45°, and though these were very irregular in shape, with very concave backs, the outer combs in no way encircled the inner ones. The comb mass is not protected by any envelope, but it is fixed together, and to the walls of the containing cavity, by pillars.

Brood of all ages may be found at any one time, and since pupae are rather scattered about, the cells are probably used more than once. However, it has been noticed that a colony does not persist for very long, and any particular nest found is invariably abandoned within a few weeks.

Stelopolybia Ducke.

The only species of this genus which was collected in Trinidad is :—

S. infernalis (Sauss.). Heights of Aripo, 20.iii.33; Mt. Harris, 2.ix.33; Nariva Swamp, 5.xii.34; Mayaro, 5.i.35; Point Galeota, 23.xii.34; Guayaguayare, 17.iv.33. A common forest species.

The nests are situated on the sheltered underside of the broad leaves of

forest floor vegetation. A typical nest examined had a funnel-shaped envelope 195 mm. long. The entrance was at the narrowest part at the bottom. Inside were eight combs; the first formed, which was the largest, diameter 55 mm., was at the top and the other combs, which were joined together, one below the next by a somewhat eccentric buttressed pillar, got progressively smaller. The comb mass was fixed to the supporting leaf independently from the envelope, and, except for a few irregular pillars, did not touch the envelope at any point (fig. 3). The paper of the envelope was yellowish in colour and very flexible. A colony is initiated by the arrival of a " swarm," which at once commences to build the envelope, at the same time allowing ample room for the future combs. Meanwhile the top comb is commenced, and as soon as the cells are formed one egg is laid in each. Later, if the colony prospers, and the growth of the comb mass fills up the envelope, the nest is enlarged by cutting away the narrow bottom part of the original envelope, and constructing in its place a second envelope more or less like the first. This gives the envelope of old nests a pinched appearance.

Old cells are re-used as soon as the first tenant leaves. The silken pupal caps project considerably beyond the general level of the comb and, after the larva has pupated, each cap is pierced by a small central hole.

The nests of this species frequently contain all stages of a Phorid fly.

Protopolybia Ducke.

Only one species of this genus was collected in Trinidad: *P. sedula* var. *diligens* Sm. Maracas Valley, 6.xi.33; 13.v.35. Common in secondary forest. The nests are found situated on the underside of broad leaves. The colony is initiated by the arrival of a " swarm."

Metapolybia Ducke.

The only species of this genus was collected in Trinidad: *M. cingulata* (Fab.).* Arima-Blanchisseuse Road, 28.v.33; Maracas, 2.xi.33; Caura Valley, 1.xi.35; Maracas Bay, 12.i.35; Aripo Valley, 16.ii.35; S. Cunapo Road, 13.xi.34. A common forest species.

The nest consists of a single layer of cells built on to a horizontal or vertical surface. The beams or masonry of houses and bridges, large tree trunks, especially trunks of *Terminalia catappa* near the seashore, are favourite situations. The covering envelope is flat; it does not touch the comb at any point. The curious " window "-like patches, noted by Rau, are also a feature of Trinidad nests. The entrance consists of one, more rarely two, short spouts near the perimeter of the envelope (fig. 10).

The nests vary much in size, the largest examined covered an area 92 cm. long with a mean width of 13 cm.

A colony is initiated by the arrival of a swarm which at once starts work on the comb and its protecting envelope. As soon as a cell is finished one egg is laid in it.

There is a considerable division of labour exhibited by the colonising swarm. A large number of the wasps remain to guard the unfinished nest, threatening any intruder by raising their abdomens. The rest of the swarm goes out foraging, some returning with pulp and others with liquid. A wasp returning with pulp gives up its load to an individual on the nest, which latter actually

* Commonly known as *M. pediculata* (Sauss.).—Editor.

does the building. Those returning with liquid regurgitate a drop of fluid on arrival and share it amongst the wasps on the nest.

Tatua Saussure.

Only one species of this genus was collected in Trinidad: *T. tatua* (Cuv.). St. Michaels Valley, N. Range, 15.ix.33; Caura Valley, 1.xi.34.

This wasp has always been collected in areas of secondary forest.

The nests are usually situated high up in a tree. They are inhabited for a very long period. One example was observed for two years and during that time did not increase in size (fig. 7).

The wasps are extremely pugnacious.

Nectarina Shuckard.

Only one species of this genus was collected in Trinidad: *N. bilineolata* var. *smithi* Sauss. St. Augustine, 25.xi.31; Mt. St. Benedict, 7.xi.34. Common in settled areas. The nests in Trinidad are usually situated amongst the leaves of small trees and hedges. Bequaert (1933) has given a full account of this species.

Synoeca Saussure.

Only one species of this genus was collected in Trinidad *S. surinamensis* (Linn.) Maracas Valley, 14.iv.35; Arima-Blanchisseuse Road, 23.xi.33; Nariva Swamp, 10.iii.35, 21.v.35; Mayaro, 9.iii.35; Oropuche Lagoon, 26.viii.33.

Synoeca is a forest wasp, but it is also abundant in well-wooded settled areas.

The nests are situated on vertical or inclined surfaces, the larger branches and trunks of trees being usual sites. In more open country the nests may be placed low down, while in forests they may be over thirty feet from the ground.

The envelope is tent-like with characteristic corrugations on either side of a thickened median ridge (fig. 9). The ridge is about 16 cm. high at the highest point, and the envelope covers an area of about 26 × 8 cm. The comb is constructed flat on the supporting surface covered by the envelope. The entrance is a short circular spout at the top of the envelope. A new nest is initiated by the arrival of a " swarm." The wasps at once lay the foundations of a full-sized nest, working on the comb and the envelope at the same time; the latter is built simultaneously on both sides of the incipient comb, each side rising as a lateral flange, until finally the two halves meet along the median ridge. While some of the wasps are busy with this work of construction, others will be seen in idle clusters in the neighbourhood.

Although the cells are re-used as soon as they become vacant, the initial nest needs to be enlarged if the colony prospers. This is done by cutting away the narrower portion of the envelope around the entrance hole, and adding a second tent-like envelope which extends higher up the supporting branch. The comb can thus be extended under the double envelope. Sometimes even a third enlargement is made in the same way. In one enlarged nest which was examined the original envelope was 33 cm. long × 16·5 cm. high and the latter overlapped the former by 10 cm., thus forming a large internal pocket. The combined comb contained five hundred cells. Brood of all ages may be found in a nest. After the full-fed larvae have spun the silken caps, the parent wasps ornament the tops of the caps with little spots and splashes of " paper."

Parachartergus R. von Ihering.

Two species of this genus were collected in Trinidad: *P. colobopterus* (Web.). St. Augustine, 18.iii.33; Maracas Valley. Not common.

P. apicalis (F.) var. ~~*uniformis* Bcq~~. Mt. St. Benedict, 17.xi.31; Mt. Tabor, 22.iv.33; Heights of Aripo, 20.iii.33; Heights of Guanapo, 30.i.35; Arima-Blanchisseuse Road, 7.iv.35; Southern Cunapo Road, 13.xi.34; Point Citron, Trinity Hills, 24.xii.34. Common.

These wasps are characteristic of forest clearings and areas of second growth; one reason for this choice no doubt being their habit of frequenting flowers.

The nests consist of a number of bracket-like combs placed one below the other, each attached independently to a common support by a short stalk from their innermost edges. The envelope is made of tough but flexible "paper," which completely encloses, but at no point touches, the comb.

The nests of *P. colobopterus* are situated on vertical surfaces such as tree trunks or parts of buildings, and since fragments of lichen are incorporated in the "paper" of the envelope they are extremely difficult to see. The nests of *P. apicalis* are situated on small twigs of trees, or on roots projecting from banks. The envelope is finely corrugated and quite conspicuous (fig. 2).

The entrance of the nests of *Parachartergus* are always at the *lowest* part of the envelope. In the case of *P. colobopterus* an elaborate ridged tunnel as much as 25 cm. long may be constructed between the entrance and the comb.

The combs of *P. colobopterus* are very irregular in shape, those of *P. apicalis* are neater and semi-circular in shape. No observations on colony formation were made.

After the full-fed larva of *apicalis* has spun the silken cap, which is situated *within* the mouth of the cell, the parent wasps ornament its upper surface with ridges of "paper" arranged in an elaborate star-like design.

Both species are frequent flower visitors and *P. apicalis* has, also, been observed in large numbers feeding on the ripening fruits of an ornamental palm. There is a very striking resemblance between the latter and the Syntomid moth, *Anycles affinis* Roths., which is frequently seen with the wasp on the flower heads of *Eupatorium*.

Apoica Lepeletier.

Though *Apoica* occurs in Trinidad as three well-marked forms, they are all considered to represent one species:—

A. pallida (Ol.). Mt. St. Benedict, 27.iv.33; St. Augustine, 5.v.32, 30.x.31, 8.vi.32; Mayaro, 24.x.34.

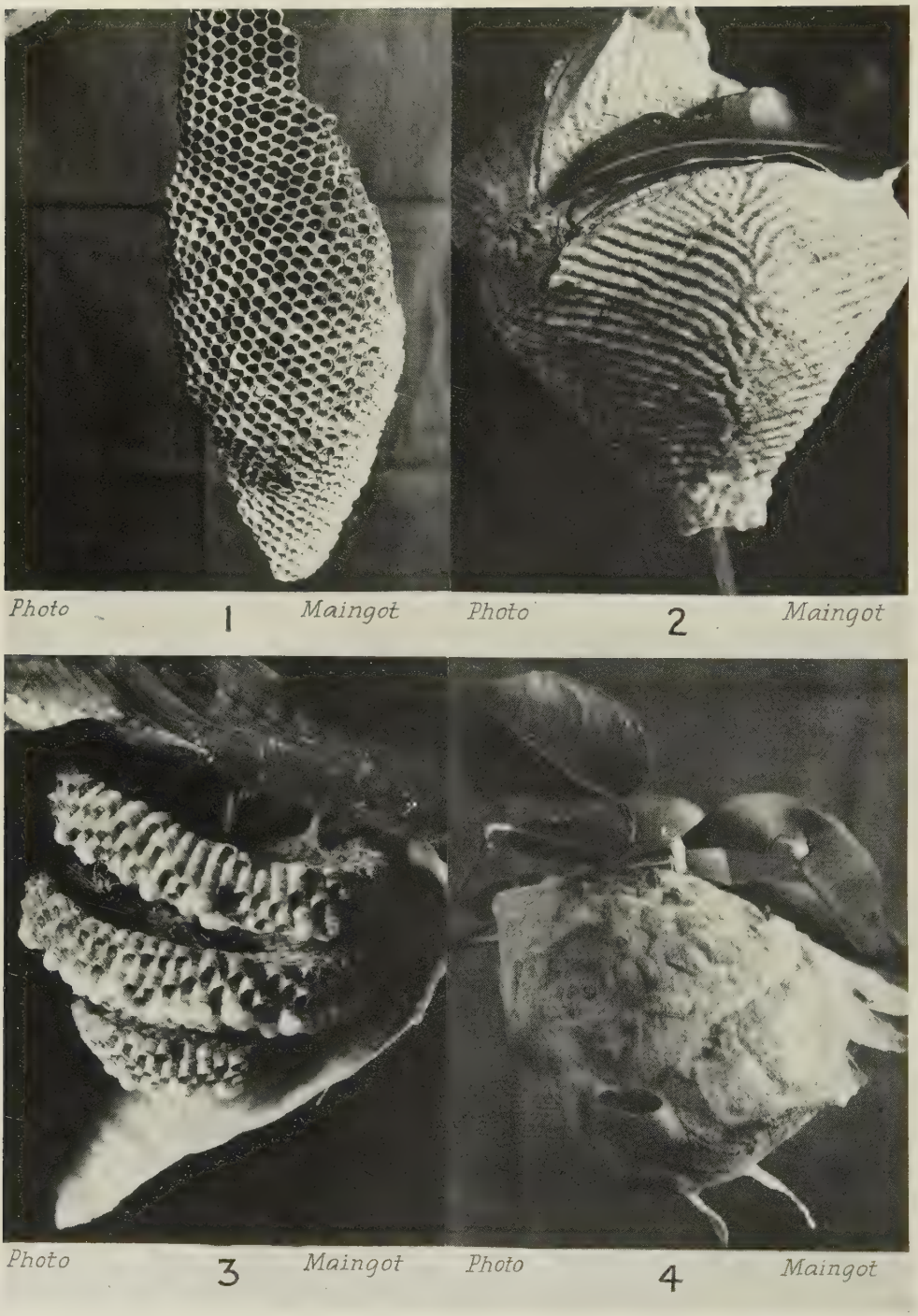
This species is common throughout areas of secondary forest and cultivation.

The nest, which consists of a single parasole-shaped comb, is usually situated in bushes and shrubs. During the day all the wasps belonging to the colony remain at rest on the nest (fig. 11). At night this wasp is a frequent visitor to lights. The adults have been collected carrying caterpillars and also covered with pollen.

A Conopid fly near to the genus *Dalmannia* very closely resembles *Apoica* and has been collected at light at the same time as the wasp.

Appendix.

In my notes on Trinidad species of the genus *Trypoxylon* (1936, *Proc. R. ent. Soc. Lond.* (A) **11**: 111–115, 3 pls.) I intimated that further unidentified



ENGRAVED BY STAR ILLUSTRATION, LONDON.

Nests and Combs of Social Wasps from Trinidad.

Photo 5 *Fitzgerald*

Photo 6 *Fitzgerald*

Photo 7 *Maingot*

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Nests and Combs of Social Wasps from Trinidad.

Photo 8 *Fitzgerald*

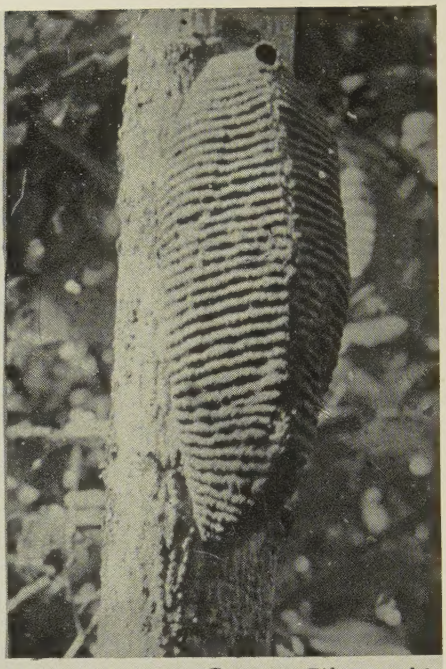

Photo 9 *Fitzgerald*

Photo 10 *Fitzgerald*

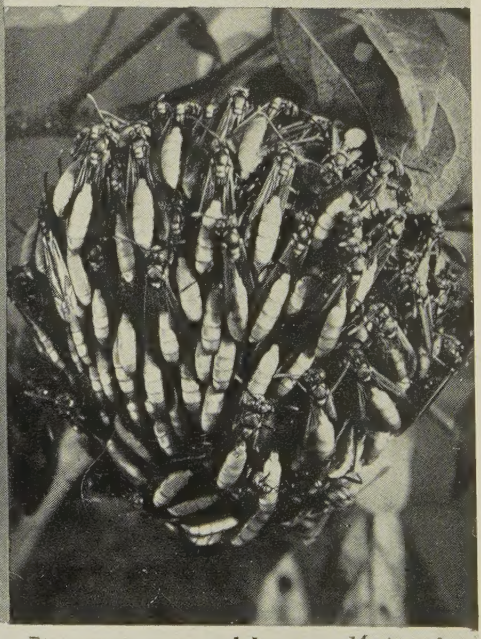

Photo 11 *Maingot*

ENGRAVED BY STAR ILLUSTRATION, LONDON.

Nests and Combs of Social Wasps from Trinidad.

specimens had been collected. Dr. O. W. Richards has now examined this material, and the following species may be added to the former list.

It is interesting to note that with two exceptions all the new records were obtained in the big block of virgin country in the east of Trinidad, which is known as the Nariva Swamp. *Trypoxylon fugax* Fab. Nariva Swamp, 5.xii.34, 23.iv.35; *T. urichi* Rich. Nariva Swamp, 5.xii.34; *T. schmidti* Rich. Mt. St. Benedict, 10.xii.34; *T. scrobiferum* Rich. Gasparillo Road, 12.i.35; *T. trinidadense* Rich. Nariva Swamp, 23.iv.35.

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Plate 1.

Fig. 1. Comb of *Polistes canadensis* (L.).
2. Nest of *Parachartergus apicalis* var. *unicolor* Beq. on branch of mango.
3. Nest of *Stelopolybia infernalis* (Sauss.). One side of the envelope removed to show the arrangement of the combs.
4. Nest of *Polybia occidentalis* (Ol.). Situated on *Citrus* branch, and showing the curious processes around the bottom rim.

Plate 2.

Fig. 5. Nest of *Gymnopolybia pallipes* (Ol.), within a hollow trunk, portion of the side of which has been removed in order to show the arrangement of the combs.
6. Unfinished nest of *Polybia sycophanta* Grib., showing exposed lower comb, which will eventually be enclosed by an extension of the envelope which has already been commenced.
7. Nest of *Tatua tatua* (Cuv.).

Plate 3.

Fig. 8. Nests of *Polybia rejecta* (Fab.) adjacent to the nest of the ant *Azteca* sp. in a guava tree.
9. Nest of *Synoeca surinamensis* (L.) on the trunk of a cacao tree.
10. Envelope of *Metapolybia cingulata* (Fab.), showing the transparent "windows."
11. Cluster of adults of *Apoica pallida* var. *virginea* (Fab.) resting on their comb during the day.